Spatial Informatics Group

Carbon Sink Act Project – Rule Identification, Life Cycle Assessment methods, Models, and Datasets

Tim Robards, David Saah, Tadashi Moody, Thomas Buchholz, Charles Kerchner, Shane Romsos, Jason Moghaddas, John Gunn

Spatial Informatics Group, LLC, Pleasanton CA

Public Stakeholder Meeting, Natural Resources Building, Sacramento CA, September 5th 2014

Background

- Respond to the “Carbon Sink Act” (Assembly Bill 1504)
- Regulations governing commercial timber harvesting take into account the capacity of forests to sequester carbon dioxide and
- Meet the greenhouse-gas (GHG) emission-reduction goals mandated for the state’s forestry sector by California Global Warming Solutions Act of 2006
- Are rules supporting mandate to reduce C emissions from forests

Project Charge Questions

- **Whether relevant statutory or regulatory requirements** governing a timber harvesting plan, sustained yield plan or its equivalent, non-industrial timber management plan, or any other discretionary approval for timber harvesting **are sufficient to ensure a net reduction or sequestration of carbon emissions** from primary forest carbon sources, sinks or reservoirs.
- **Whether regulations governing conversion** of timberland and forestland to non-timber and non-forest uses **are sufficient to offset lost sequestration capacity and carbon emissions** associated with the non-timber use.
- **Whether forest growth, harvest and conversion information** obtained through the BOF's regulatory and non-regulatory programs and other local, state and federal sources **is sufficient and reliable** to track changes in carbon stocks, including net emissions and reductions, across the state's forested landscape.

Technical tasks

- Task 1. Identify the regulations and practices that could significantly affect carbon sequestration processes and trends.
- Task 2. Clarify the temporal framework for analysis.
- Task 3. Clarify the spatial framework for analysis.
- Task 4. Evaluate and provide options regarding the best existing data, analytical methods, forest growth models, and climate models.
- Task 5. Identify gaps in data and analytical tools.
- Task 6. Place methods into context of a Life Cycle Analysis.

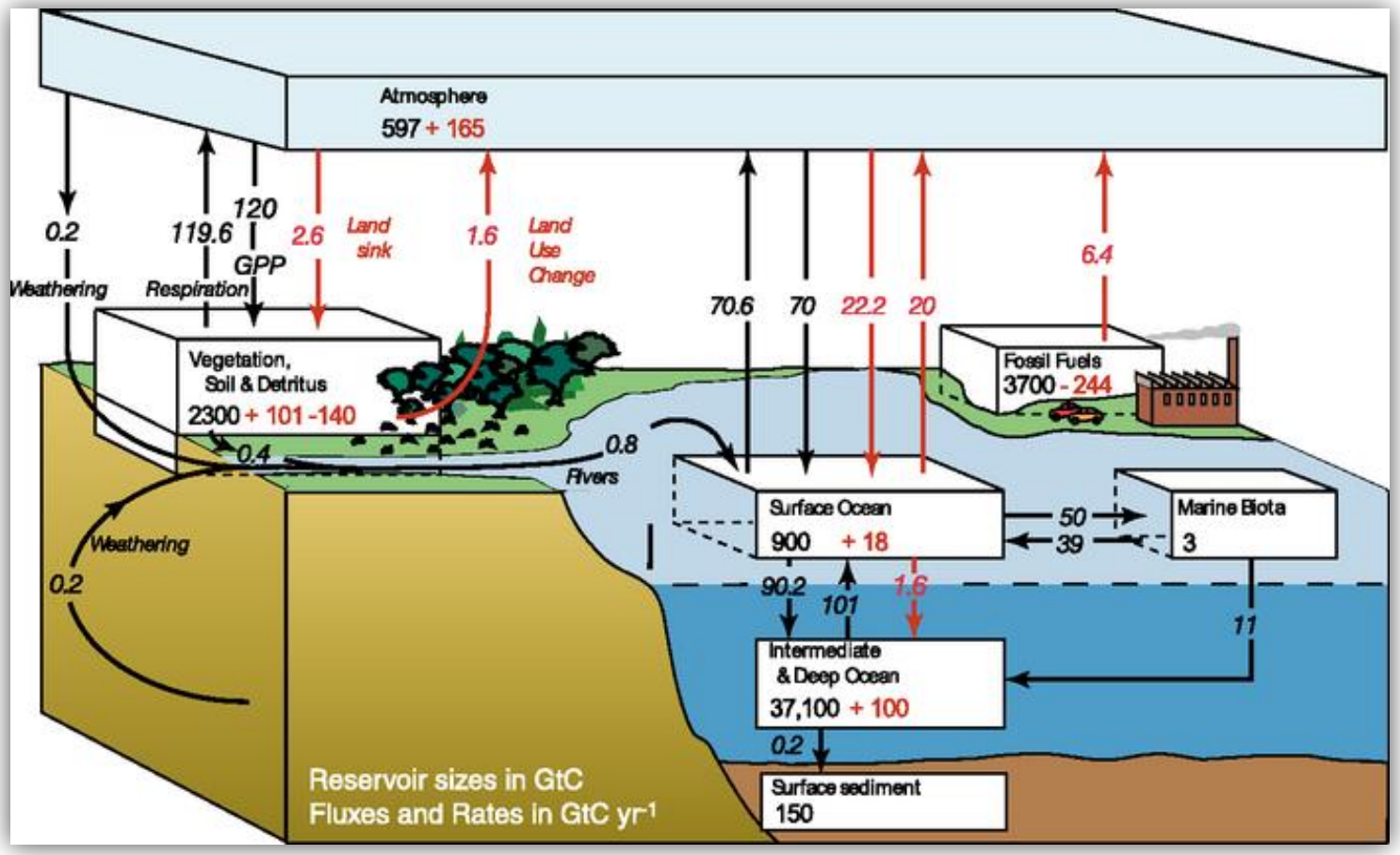
Project Schedule

Task	Planned Due Dates ("X")						
	July	August	September	October	November	December	Early 2015
Project Kickoff	X						
Identify Forest Regulations			X				
Identify Spatial & Temporal Context			X				
Identify Available Data, Models & Methods			X				
Identify Gaps			X				
Public and Stakeholder Outreach			X			X	X
Draft Report					X		
Science Advisory Review						X	
Final Report							X

Presentation Outline

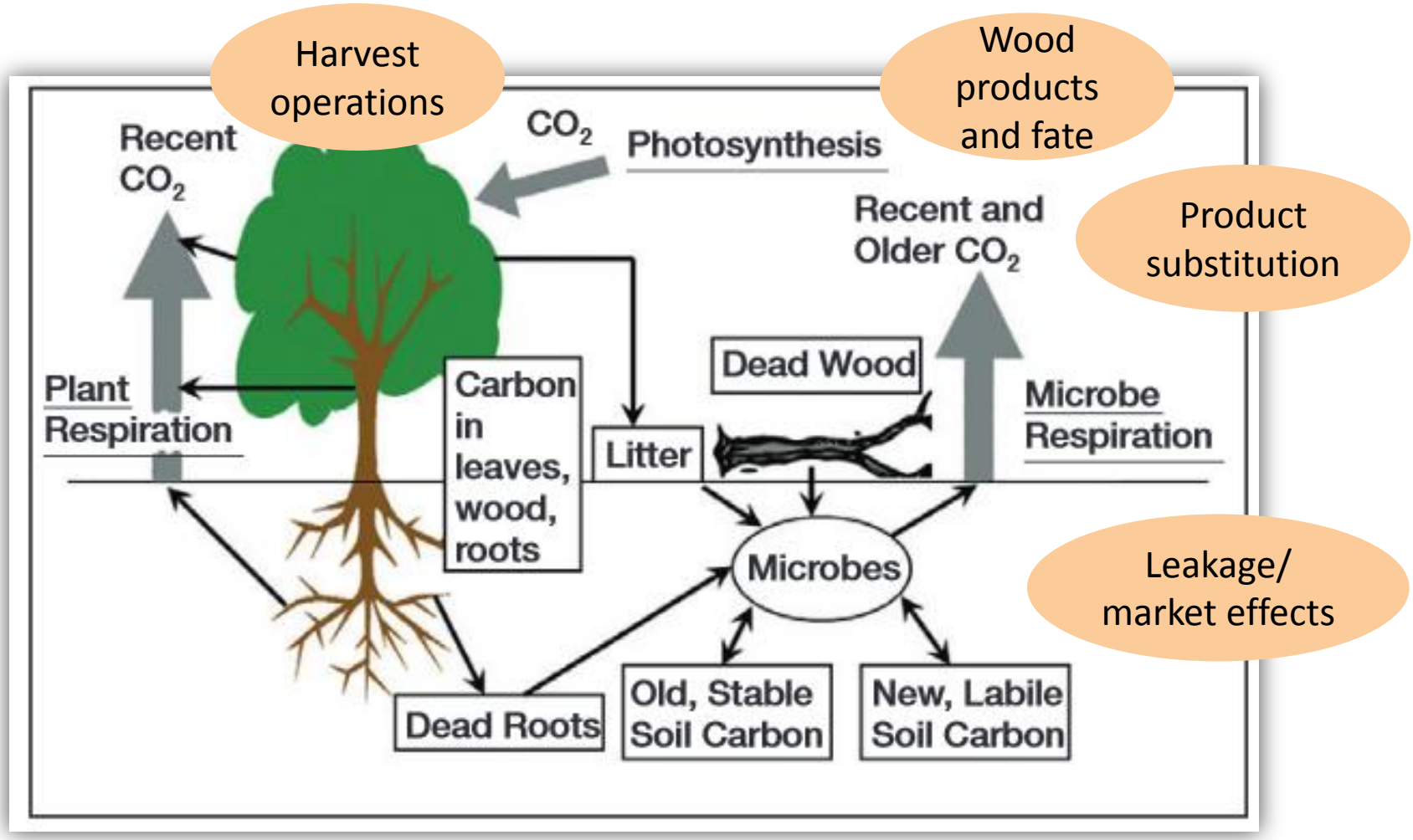
- Refresher: Forests and the carbon cycle
- Life Cycle Assessments: system boundaries and baselines (Task 6)
- Regulations reviewed (Task 1)
- Temporal considerations (Task 2)
- Spatial considerations (Task 3)
- Datasets and models (Task 4)
  - Identify gaps (Task 5)

The Carbon Cycle



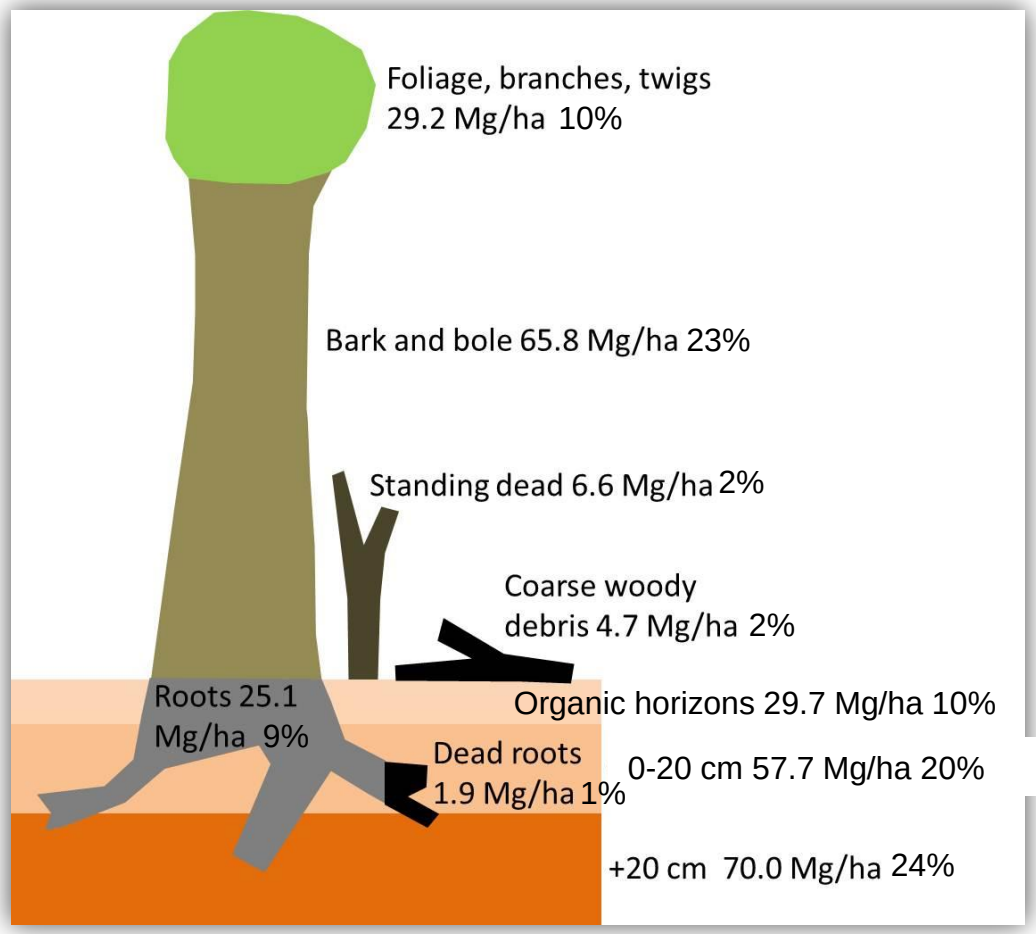
Source: IPCC, 2007, Figure 7.3, p. 515

Forest ecosystem carbon cycle



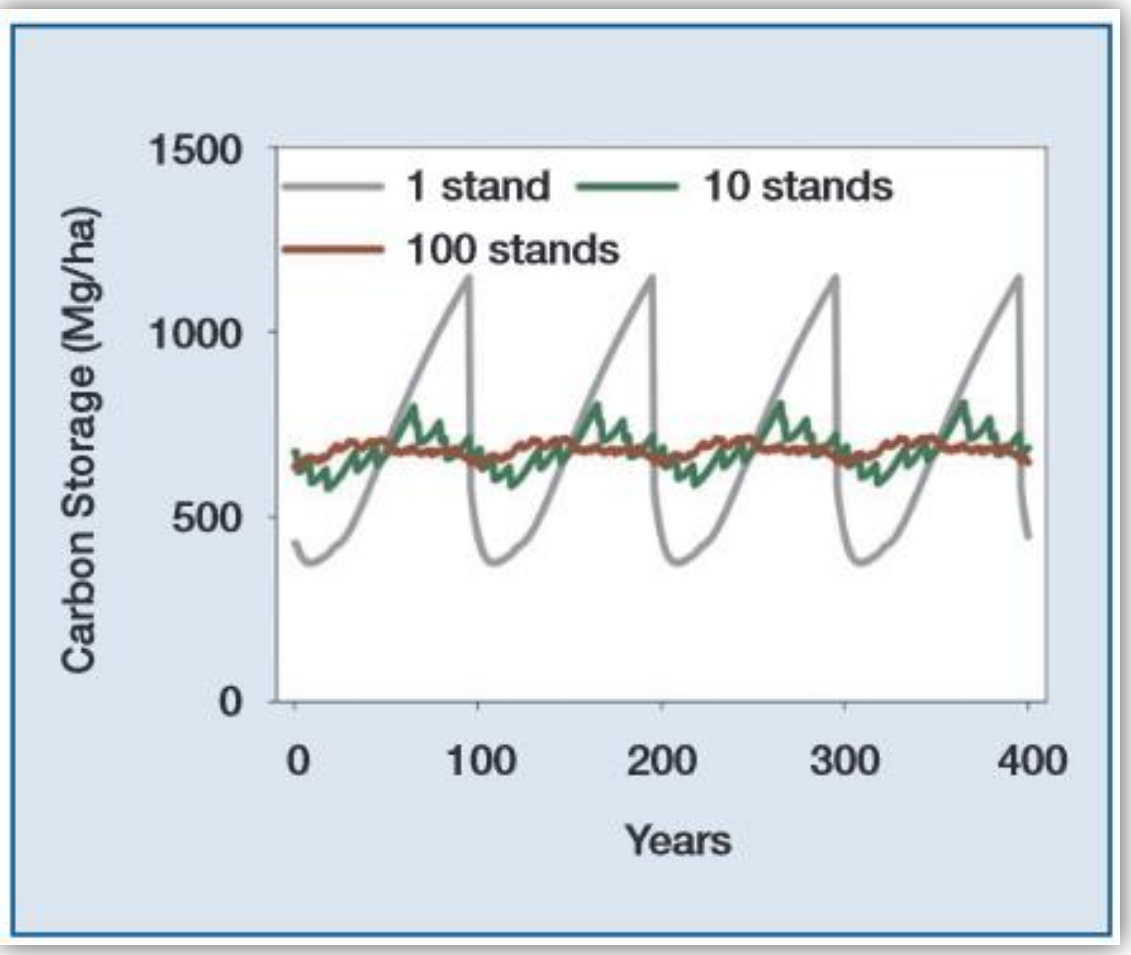
Source: Ryan et al. 2010

Forest ecosystem carbon pools



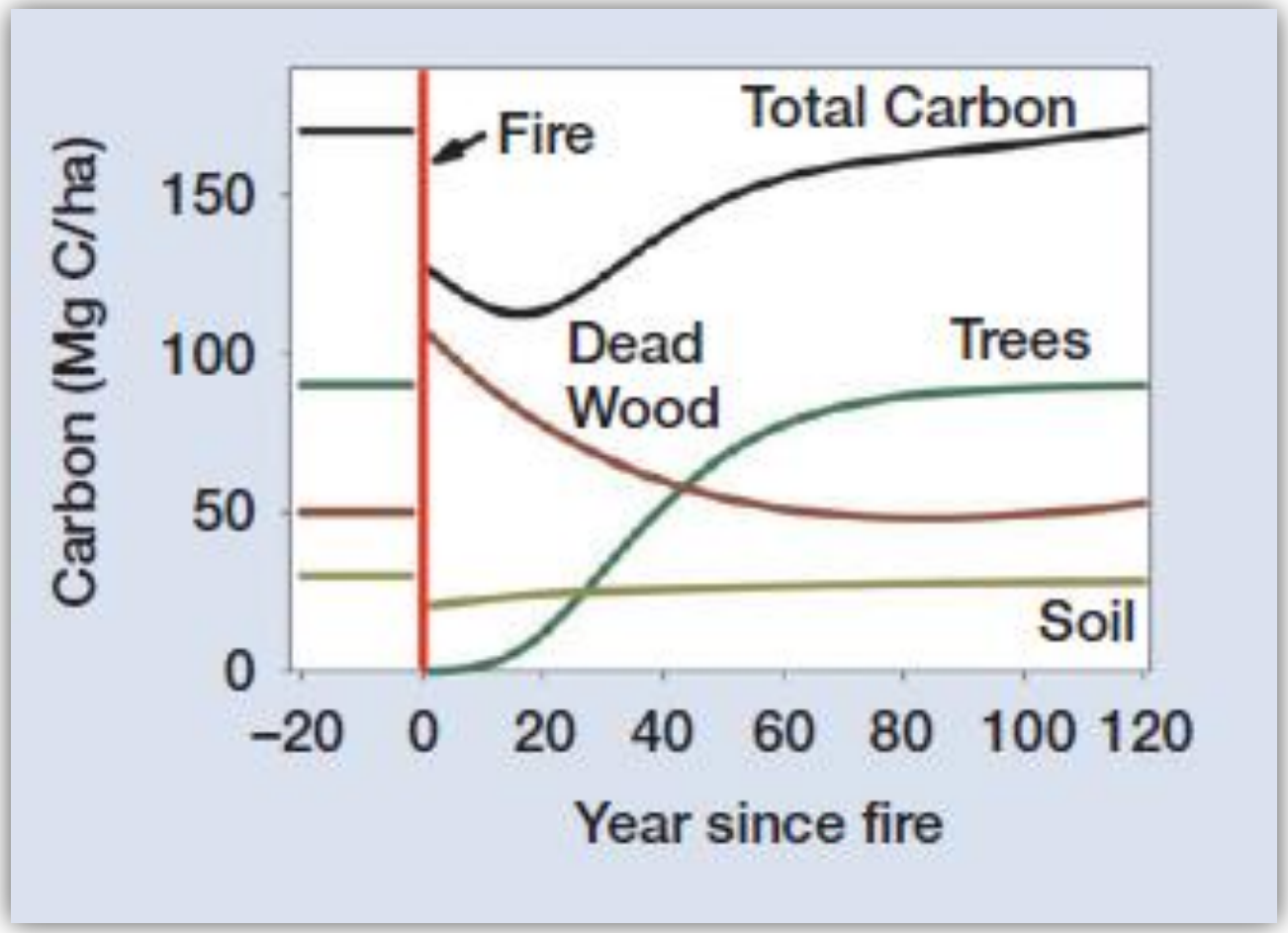
Relative size of C pools for northeastern forests based on Fahey et al. 2005

Forest ecosystem carbon cycle



Source: Ryan et al. 2010

Temporal & spatial complexities



Source: Ryan et al. 2010

Public & Stakeholder Clarifying Questions

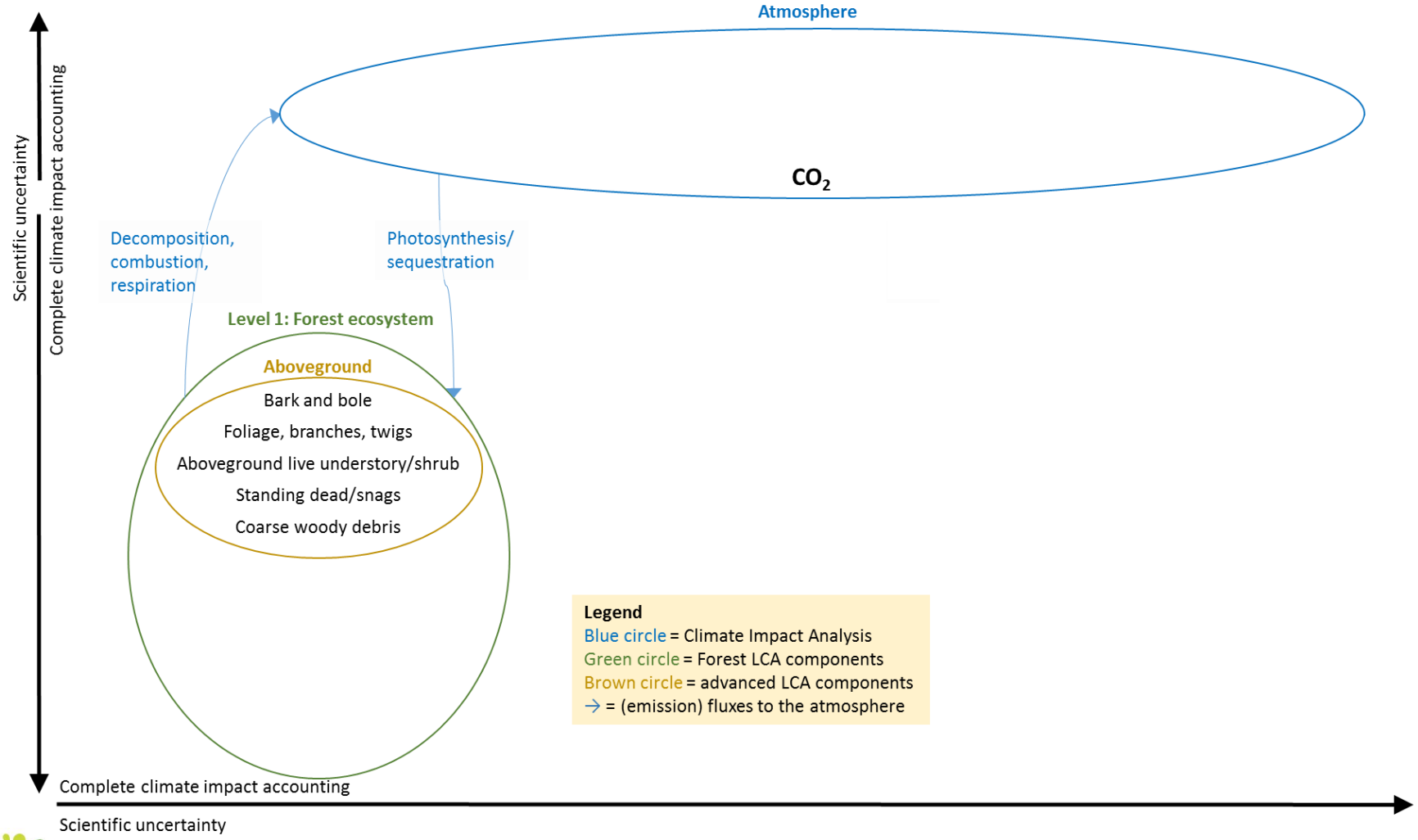
- Are there any clarifying questions from the public or stakeholders about the refresher information presented thus far?

LCA description

- LCA addresses the environmental aspects and potential environmental impacts) (e.g. use of resources and environmental consequences of releases) throughout a product's life cycle from raw material acquisition through production, use, end-of-life treatment, recycling and final disposal (i.e. cradle-to-grave).
- Four phases of an LCA study:
  - Goal and scope definition phase (boundary, level of detail, baseline)
  - Inventory analysis phase (datasets, models),
  - Impact assessment phase, and
  - Interpretation phase.

Source: ISO 14044:2006

Life cycle assessment - boundaries



Deciding on boundaries

Financial accounting principles to determine decision usefulness of information:

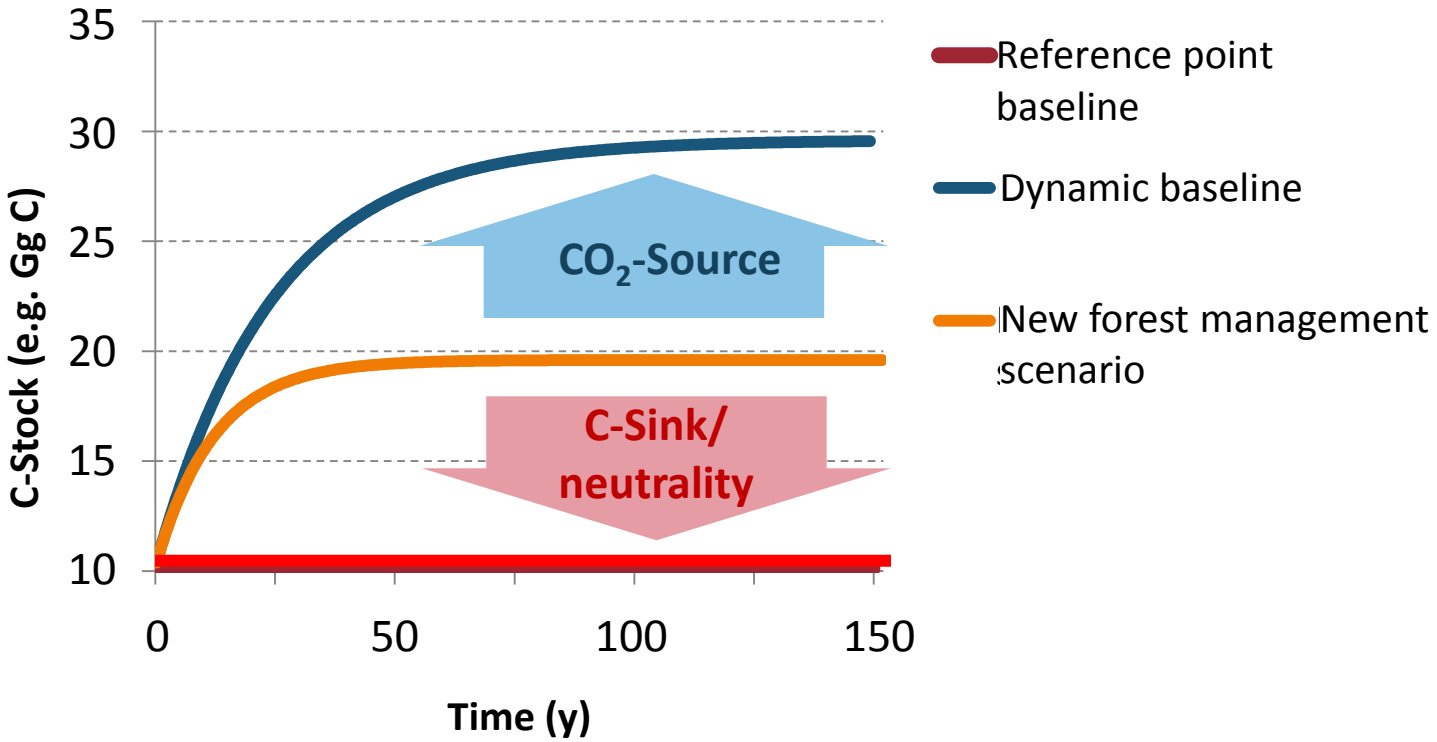
- Reliability:
  - Verifiability (clear assumptions)
  - Representational faithfulness ('monitor what you can measure')
  - Secondary:
    - Comparability (common methods and formats)
    - Neutrality (unbiased data)
- Relevance:
  - Timeliness (recent data)
  - Predictive value (data associated with acceptable degrees of uncertainty)
  - Feedback value (data will impact current actions)
  - Secondary:
    - Comparability (common methods and formats)
- Deciding on boundaries requires trade-offs amongst accounting principles

Source: SFAC 1980

Public & Stakeholder Input on Analysis Considerations - Boundaries

- What boundaries should be considered in the analysis?
  - Forest ecosystem level (above & below ground carbon)
  - Forest ecosystem + operations (e.g., carbon associated with harvest, biomass handling, transport, etc.)
  - Forest ecosystem + operations + products (carbon associated with processes products, handling losses, landfill, etc)
    - Direct vs indirect
- What else is important to consider with respect to boundaries?

Life cycle assessment - baselines



Deciding on baselines

- Baseline principles (Gustavsson et al. 2000)
  - Accuracy:
    - Capturing spatial and temporal uncertainty
  - Comprehensiveness:
    - Data: “Are all carbon pools and fluxes accounted for?”
    - Drivers: “Are all GHG emission drivers considered?”
  - Conservativeness:
    - Prevent excessive GHG emissions deviation from baseline
  - Practicability:
    - Ease of data collection and processing
- Deciding on a baseline principles requires trade-offs these principles

Public & Stakeholder Input on Analysis Considerations - Baselines

- What baseline options should the project team consider?
  - Data-driven:
    - Compare future data points with current data points (reference point baseline)
    - Compare CA datasets with data from less regulated states with sufficient similarities (dynamic baseline)
  - Model-driven: model scenarios in absence of rules (dynamic baseline)
- What else is important to consider with respect to baselines?

Regulations and practices

- Forest Practice Act
- Forest Practice Regulations
  - Identified 224 rules that with potential GHG consequences
- Cal. Pub. Res. Code Division 4. Part 2.
  - Wildland fire preparedness
- Wild & Scenic Rivers Act
- Professional Foresters Law
- Professional Foresters Laws and Regulations
- CEQA
  - 14 CCR 15064.4(b): Determination of whether a project may have a significant effect on the environment

Public & Stakeholder Input on Forest Regulations & Practices

- Are there other forest-related regulations, practices, rules, or laws that likely affect carbon sequestration that we have not yet identified?

Temporal Framework: Measurement & Reporting Frequency

- Task - Identify the reporting frequency for re-analysis in the context of the key target dates of 2020 and 2050

Public & Stakeholder Input on Measurement & Reporting Frequency

- Which measurement and reporting frequencies are relevant to inform decision makers?
- What other reporting cycles should be considered (e.g. FRAP, ARB)?

Temporal Framework: Measuring Effectiveness

- Task - given the long life spans of trees, forward a recommendation on the duration of time needed to measure the effect of various forest management rules on carbon sequestration.

Public & Stakeholder Input on Duration Needed to Measure Forest Regulation Effectiveness

- How much time is needed to demonstrate the effect of forest rules on carbon sequestration?
- What other temporal considerations are important?

Spatial framework

- Task - Determine the population of interest knowing that private, state and local public, commercial timberlands are regulated by the Forest Practice Act.

Public & Stakeholder Input on Spatial Considerations

- What is the population of interest?
- How should we stratify the population for the analysis?
  - Should non-commercial conifer and hardwood forests also be analyzed?
  - Should rangelands be included?
  - Given that the ARB Scoping Plan relies on all California forestlands, should federal lands be included in a full analysis, a reduced level analysis, or at all?

Existing Datasets (1)

- Climate data
  - Data from weather station data
  - Historical data processed and interpolated from PRISM
- Vegetation/inventory data:
  - FRAP
  - Landfire
  - ARB carbon inventory data
  - FIA (incl. FIDO, COLE , FORCARB2)
  - Forest Service spatial and attribute data for National Forests
  - Lookup tables Smith et al 2006; 1605(b)
- Soil data:
  - SSURGO
  - STATSGO
  - Lookup tables Smith et al 2006; 1605(b)

Existing Datasets (2)

- Harvest data
  - BOE harvest data
  - Third party timber data on production and exports,
  - TPO (Timber Products Output Database)
  - CEC bioenergy and biannual climate change reports/data,
  - CAL FIRE Timber Harvesting Plan GIS and database
- Wood products data
  - USFS Harvested Wood Products Modeling Application
  - Lookup tables Smith et al 2006; 1605(b)
  - CORRIM
  - TPO data

Available Models (1)

- Climate models
  - Downscaled climate projections from Scripps Institute from CEC
  - General Circulation Models (GCM)

- Forest growth/carbon models
  - Forest Vegetation Simulator (FVS)
  - FORSEE
  - FPS
  - CONIFERS
  - Carbon Budget Model of the Canadian Forest Sector (CBM-CFS3)
  - FASOM Forestry and Agricultural Sector Optimization Model (USDA)
  - Carbon OnLine Estimator (COLE)
  - FORCARB2: An updated version of the U.S. Forest Carbon Budget Model
  - U.S. Forest Carbon Calculation Tool (CCT)

Available Models (2)

- Fire models
  - FlamMap
  - CONSUME
  - Intregrated Wildfire Analysis Portal (IWAP)
- Forest sector/economics models
  - FASOM Forestry and Agricultural Sector Optimization Model (USDA)
  - Subregional Timber Supply Model SRTS
  - U.S. Forest Products Module (USFPM)
- Forest product models
  - WOODCARB2
  - ForGATE - A Forest Sector Greenhouse Gas Assessment Tool

Public & Stakeholder Input on Datasets and Models

- Are there other existing datasets that we have not identified?
- Are there new datasets needed to address forest management rules effects on carbon sequestration?
- Are there other existing models that we have not identified?
- Are there new or modified models needed to estimate forest carbon sequestration relative to forest rules?

Next Steps

- **Post summarized meeting notes on project website** http://ucanr.edu/carbonsinkact
- **Receive written comments (Due: September 26, 2014)**
- **Draft Report – send to public and stakeholders (mid-November 2014)**
- **Hold public/stakeholder meeting (early December), receive additional input**
- **Final Report – Present to Board of Forestry (Early 2015)**

Spatial Informatics Group

Thank you

Project website: http://ucanr.edu/carbonsinkact